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ABSTRACT

Every program evaluation should provide formative as well as summative data; evaluators should tell educators more about the causes of program failure and less about the consequences. Evaluation should address itself primarily to program improvement rather than to program assessment. Such an emphasis has been previously impossible since little has been known about the variables affecting the acquisition of knowledge by students. Recent research, however, has uncovered a number of variables affecting learning in schools that can be assessed when doing program evaluation. These variables can be arranged into a systems model. In this model, goals, objectives, program design, teacher characteristics, and student characteristics constitute major inputs; teaching and learning styles and methods and student-teacher interactions constitute major process elements; and short- and long-term results constitute the outputs of the system. Activities in the St. Boniface School District exemplify ways in which these variables can be used in program development. An attempt is made to periodically assess each variable over several years and use the data in controlled small-scale experiments attempting to find ways to maximize learning. (Author/JM)

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UNE RECETTE D'APPRENTISAGE:

ADMINISTRATOR ACCOUNTABILITY AND THE CORRELATES OF STUDENT ACHIEVEMENT

Peter Coleman

A Paper Presented at the Annual Conference of the
Quebec Association of School Administrators

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The basic proposal in this paper is a simple one: purely summative evaluation of educational programs is dysfunctional: it invariably finds that programs, schools, or school systems are relatively unsuccessful. This creates public unease and reduces teacher and administrator morale, making school programs even less successful. Every program evaluation should provide both summative and formative data: evaluators should tell educators more about the causes of program failure and less about the consequences. In other words, evaluation should address itself primarily to program improvement rather than to program assessment.

Such an emphasis has been virtually impossible since little has been known about the variables affecting the acquisition of knowledge by students. This situation is changing rapidly. This paper will review the variables affecting learning in schools, and propose ways of applying this knowledge, on the grounds that one important thing for which administrators should be held accountable is acquiring and utilizing relevant knowledge.

There is a massive literature on program evaluation. One branch of the recent literature begins with the Coleman Report (1966) and subsequent reconsiderations (Mosteller and Moynihan, 1972; Mood, 1970; Jencks et al, 1972), attempting to identify the outcomes of schooling and the gross input variables associated with these outcomes. The culmination of this branch is a recent, large-scale and aptly-titled study, The Enduring Effects of Education (Hyman, Wright and Reed, 1975). A second branch of the literature is largely concerned with accountability and tends to deal with goals and major outcomes, including cost-effectiveness concerns.

A third branch of the literature has dealt with student characteristics, including stages of development (see, e.g., Phillips, 1969), motivation and self-concept (see, e.g., Covington & Beery, 1976; Coopersmith, 1967; Purkey, 1970), and the issues associated with grouping for instruction by means of student characteristics (see a review by Esposito, 1973). A fourth branch of the literature has dealt largely with program design elements. There is a very extensive literature on facilities, in particular open area schools and open education (see, e.g., Traub et al, 1976), on time as an important variable (see, e.g., Harnischfeger & Wiley, 1976), on program sequencing (see, e.g., Cage & Berliner, 1975, on IGE), and on testing to measure

student progress (see, e.g., Bloom, et al, 1971).

More recent work has dealt with teaching/learning concerns, such as teaching style and methodology variables. There are standard works on methods (see, e.g., Gage, 1976), and on the dimensions of effectiveness (see, e.g., Gage, 1972) and a very interesting recent analysis of the differential effects of teaching styles (Bennett, 1976). Another branch of the literature has focussed on the conditions of learning and learning styles. Such work as Bloom's on mastery learning (see Bloom, 1976, and Block, 1971) is the most recent variant. The last branch has dealt with student/teacher interaction, generally focussing on the classroom behaviour of teachers (see, e.g., Westbury & Bellack, 1971, Borich, 1977), classroom climate and environment (see, e.g. Jackson, 1968, Anderson & Walberg, 1974), matching of teachers and students (see, e.g. Hunt, 1971), and classroom management (see, e.g., Kounin, 1970).

One can visualize all of this work as relating to a fairly simple systems model, in which goals and objectives, program design, and teacher and student characteristics constitute major inputs, teaching and learning styles and methods, and student/teacher interactions constitute major process elements, and short and long-term results constitute the outputs of the system. Indeed, most recent considerations of programs and their evaluations have explicitly or implicitly been based on such a model. Perhaps the most interesting recent description of such a model is that of Harnischfeger and Wiley (1976; but cf. McDonald, 1977).

The model proposed here is derived from that of Harnischfeger and Wiley, but is more inclusive. It is a model of the teaching-learning process in the same sense of the term "model" that is "a conceptual scheme that identifies a set of constructs relative to academic achievement and the relationships among them" (Hallinan, 1976, p.47). The Harnischfeger and Wiley model deliberately limits its scope to the traditional classroom (Hallinan, 1976, p.48) and ignores such potentially important sources of influence on student achievement as institutional factors. Erickson, in his critique of the model, suggests that there are some institutional factors which "may influence student performance in the classroom directly and powerfully" (1976, p.62). The model also seems unnecessarily limited in the area of outcomes. It is probable that there are at least four types of

outcome variables worth consideration, and the model proposed here develops these in some detail.

This list of variables is not exhaustive, but virtually all of the topics treated within this list of twelve major variables have been shown to influence the overall educational process. Most research cited is less than convincing, but does suggest the importance of a rather inclusive approach to a model of instruction: "Successful teaching is based upon a large number of variables that must be present to a minimum degree rather than upon two or three critical factors" (Good and Grouws, 1977, p.127) and this also seems to be true of variables other than teaching.

Although the chart does not indicate this, it is clear that all the groups of variables interact with each other, and that the combined effect of input variables is directly important to both process and output variables. Process variables also affect output variables.

MAJOR VARIABLES AFFECTING EDUCATIONAL PROGRAMS

Coleman, April, 1978

A. Input Variables

1. EDUCATIONAL GOALS
   - Generality
   - Stability
   - Priority

2. PROGRAM DESIGN
   - Objectives
   - Sequences
   - Time allocations

3. STUDENT CHARACTERISTICS
   - Socioeconomic status
   - Intelligence and age
   - Self-esteem
   - Previous achievement
   - Attitudes to school

4. TEACHER CHARACTERISTICS
   - Academic level
   - Verbal ability
   - Training recency

B. Process Variables

1. INSTITUTIONAL SETTING
   - School climate
   - Physical facilities
   - School size

2. TEACHER/STUDENT INTERACTIONS
   - Classroom management
   - Task orientation
   - Questioning
   - Variability
   - Expectations

3. STUDENT LEARNING STYLES
   - Advantaged/disadvantaged
   - Success orientation/failure avoidance
   - Aptitude
   - Conceptual level

4. TEACHING STYLES & METHODS
   - Classroom organization
   - Use of time
   - Content coverage
   - Monitoring student work
   - Methods of presentation

C. Output Variables

1. ENDURING EFFECTS
   - Economic benefits
   - Knowledge
   - Receptivity to knowledge

2. PROGRAM COSTS
   - Cost-effectiveness
   - Accountability
   - PPBES

3. STUDENT ACHIEVEMENT
   - Standardized tests
   - Formative evaluations
   - Affective outcomes

4. PERCEPTIONS OF SCHOOLING
   - Parent opinion
   - Student opinion
   - General public opinion
   - Teacher opinion

A. INPUT VARIABLES

These variables include all the pre-existing conditions with which educators must cope in their efforts to maximize achievement. They are undoubtedly important, although there is some disagreement as to precisely how much input variables determine achievement.

The Coleman Report (1966), and subsequent analyses of the same data, maintained that 80% of the individual variance in student achievement is determined by input variables (Berliner and Rosenshine, 1976). Equally convincing arguments have been made in opposition to or support of this contention (Spady, 1973; Sanders, 1977). The most recent and carefully controlled studies have suggested that, in the primary grades, "classroom instructional processes predicted as much or more of the outcome score variances than did the entering school test scores of children" (Stallings, 1977, p.113). At the secondary level, McDill and Rigsby suggest that "the upper limit which variation in quality of school environment could have had on the achievement of students . . is 28.5%" (1973, p.128). Of course methodologies and measures are quite different here, but the conclusion that primary school children are more open to influence, despite input variable effects, is appealing.

A.1. Educational Goals

In the last twenty years or so there has been considerable concern to state educational goals explicitly, in part for evaluative purposes (see Bloom, 1956). These attempts to develop goal statements generally have revealed that the goals of education do not change much over time, although there is some tendency for recent goal statements to suggest social purposes (Derr, 1973). The list of goals included as part of the Educational Goals and Objectives program distributed by Phi Delta Kappa has been widely used across North America in programs of community involvement in goal-setting, and the results of priorizing the goal statements are almost always the same (Spears, 1973). Nor do the resulting lists much differ from those of, for example, the Pennsylvania Department of Public Instruction (1968) or the Canadian Teachers' Federation. Hoepfner et al (1973) surveyed national priorities and found an emphasis on affective goals, somewhat inconsistent with earlier priorities. The priorities established almost invariable identify two vital goals, the development of basic skills of literacy and numeracy, and of

personal autonomy based on self-knowledge and self-confidence. In general, lists of goals are consistent with the overall taxonomies developed by Bloom and his colleagues (Bloom, 1956; Krathwohl, Bloom & Masia, 1964), although some social competence goals usually appear as well.

The importance of such general goal statements lies in the influence they have on program design, and particularly on time allocations, and expenditures. However, it is reasonable to suggest that most goal statements represent inferences regarding values drawn from current emphases, rather than free choice value statements.

A.2. Program Design

Although a great deal of effort is currently being devoted to program design, it is difficult to demonstrate that it is a critical variable in general. Berliner and Rosenshine, in their review of research on the acquisition of knowledge in the classroom (1976), maintain that in general "one curriculum is neither intrinsically better nor worse than another, but rather that different curricula result in different patterns of acquiring knowledge" (p.3). This is not true at the level of individual students, however. The important variables here seem to be specification of objectives and control of content, and time allocations.

This view is supported by reviews of "process-product" studies of teacher effectiveness (see, e.g., Rosenshine & Furst, 1971), which generally find a close relationship between "opportunity to learn" and student achievement. The major study is that of Husen (1967), a cross-cultural study involving 300,000 students in twelve countries.

Opportunity to learn is related to time, in Carroll's model of school learning (1963) which became the basis for mastery learning. The model suggests that the amount of learning is a function of time spent divided by time needed, and hence that students learn different amounts largely because the time variable is held constant for them in the ordinary classroom (Block, 1971, p.5). The genesis of Carroll's model was his study of foreign language acquisition (1963a). This may limit the generalizability of the time variable, which is supported by Canadian research on the acquisition of

French by Anglophones in core French or Immersion settings (see Swain, 1974) or by some Francophones. A major Manitoba study found strong relationships for Franco-Manitoban students between achievement in French, and the percentage of time it was used for instruction. This is not true for English, suggesting that for Franco-Manitobans, learning French is like learning a second language (Hébert et al, 1976).

The time variable is fundamental to the model of instruction proposed by Harnischfeger and Wiley (1976) which grew out of the Carroll model. They propose three critical elements: first, "the more time an individual spends trying to learn, the more he will learn"; second, "tests will vary in the degree to which they embody the content of any given curriculum", (i.e. the opportunity to learn element already discussed); third, "the periodic character of classroom activiites" in which " a small number of distinct forms, such as seatwork or the reading group, recur with great regularity" (p.6).

The importance of time as a variable in learning may perhaps be overemphasized in the Harnischfeger-Wiley model. Attempts to assess the link between time & achievement have met with modest success at best, and in fact those focussing on the upper grades have found no association whatsoever (Hallinan, 1976). However, the emphasis of the model is supported by the follow-through data (see, e.g., the report by Stallings, 1977). It is perhaps significant that this research used children in the first and third grades, and instruction in reading and mathematics. It is entirely consistent with the experience of educators that time is more important in the primary grades, and is directly associated with learning. In subsequent grade levels. there are a wider variety of external influences which both detract from and contribute to achievement, and classroom time allocations hence are reduced in importance.

Notions of sequence of program design have at least three justifications. First, the sequence may reflect sequence in learning, like Gagne's (1970) hierarchy of eight types of learning, of which learning to respond to signals is the first type, and problem solving the last. Early types are prerequisite to later types. Second, sequences may reflect the level of difficulty of the material: "sequence emphasizes not duplication, but rather higher levels of treatment with each successive learning experience" (Tyler, 1949, p.85). Third, sequences may utilize the general structure

of the discipline being studied. "If earlier learning is to render later learning easier, it must do so by providing a general picture in terms of which the relations between things encountered earlier and later are made as clear as possible" (Bruner, 1963, p.12).

The critical variables in program design can be summarized under the "opportunity to learn" criterion. If the objectives, content and materials in the program are internally consistent, and match test emphases, they will maximize "opportunity to learn". Then if time allocations are adequate, for all students, student achievement will be high.

A.3. Student Characteristics

Typcially the study of student characteristics has dealt with issues such as ethnicity, intelligence, socioeconomic status, and the relation of these to school achievement. The classic document is the Coleman Report (1966), although there have been many other such studies (of which the major ones are reviewed in Heath & Neilson, 1974). Much of this research has focussed on administrative problems such as grouping students for instruction, deviant behaviour, or in the case of the major studies, segregation or integration of students from different racial or ethnic backgrounds. Generally, the results of such studies have been rather inconclusive. However, the studies rarely support common administrative practices.

For example, a recent review of research examined "the issue of whether ability grouping tends to enhance or reduce school learning experience" (Esposito, 1973, p.163), on the grounds that this was important to improving the effectiveness of educational environments. The standard pattern at present in American education, and no doubt in Canadian, is homogeneous grouping. There is little doubt that this has led to de facto class and ethnic segregation in the public school classroom. The basis of grouping has been ability generally defined as intelligence plus past academic achievement. Esposito's careful review suggests that, with respect to academic achievement, ability grouping seems to favour learning in high ability students, and is unfavourable for average and below average students. With regard to affective development, findings suggest that homogeneous grouping tends to inflate the self-esteem of children in high ability groups, and reduce the self-esteem of children in average and below average ability groups.

Recently, more attention has been paid to some less salient characteristics of students, in particular self-esteem. Since about 1960, research in self-esteem and school learning has been extensive. Much of the early research was reported by Coopersmith (1967), and Purkey (1970). There is now little doubt that it is an important variable: "there is a persistent and sngnificant relationship between the self-concept and academic achievement at each grade level" (Purkey, 1970, p.27). Torshen's (1969) summary of studies showed that academic self-concept was clearly defined by the end of the primar grades, and that its correlation with achievement was in the order of +.50. This student characteristic is useful as a predictor of achievement: one study found that self-concept in Kindergarten children was a better predictor of reading success in subsequent years than I.Q. (Wattenberg & Clifford, 1962). Unsuccessful students are likely to have low self-concepts: a comparative study of drop-outs versus school attenders found that drop-outs had significantly lower self-concepts (Harding, 1966); poor readers are also likely to have low self-concepts (Zimmerman & Allebrand, 1965). Successful students are likely to have high self-concepts, although the most extensive study found that a surprisingly large minority of high self-concept children did not perform well (Brookover et al, 1967). In general, the relationship between self-concept and achievement is so pervasive that the variable deserves attention in any consideration of educational programs (Gill, 1969).

Other critical student characteristics, determining achievement to a substantial degree, are socioeconomic status, intelligence, and previous achievement. Socioeconomic status is a significant variable. A major process-product study by Brophy & Evertson (1977) found that the data made sense when considered separately for high and low socioeconomic status populations. Similarly, Traub and his associates (1976) found that open area classrooms had different effects on high and low socioeconomic status children. (This is my inference, based on descriptions of shcool populations.) In secondary schools, the major study (McDill and Rigsby, 1973, pp.27,28) which had a student population of 20,000 in a wide variety of schools, demonstrated that personal socioeconomic status was an important predictor, although community socioeconomic context was not (p.120).

Intelligence and socioeconomic status are excellent predictors of student achievement. For example, one major cross-cultural study of student achievement suggested that they are so powerful in accounting for student achievement in subjects like reading and social studies that "there may not be enough variance unaccounted for in the performance of students to attribute to the influence of teachers" (Borich, 1977, p.54). These in turn influence early achievement and for later school years the combined influence of these three factors is very powerful indeed, explaining at least 71.5% of the variance in achievement (McDill & Rigsby, 1973, p.128).

A.4. Teacher Characteristics

Many years of intensive research on the characteristics of teachers which are associated with classroom effectiveness have been rather unproductive (Gage, 1972). However, in a previous paper on teacher effectiveness (Coleman, 1973; also in Borich, 1977) I identified "cognitive development" as an important variable. This has received some support from subsequent research (Borich, 1977, p.202). The earlier paper proposed the use of three "proxies" or indicators of cognitive development: verbal ability, academic achievement, and recency of academic training.

The first of these, verbal ability, was found to be important by the Coleman Report (1966), and Levin has maintained, for example, that "recruiting and retaining teachers with higher verbal scores is five to ten times as effective per dollar of teaching expenditure in raising achievement scores of students as the strategy of obtaining teachers with more experience" (1970, p.24). Similarly, re-analyses of the Coleman Report data have demonstrated that both general levels of academic training, and more importantly recency of academic training is closely associated with student achievement levels (Hanushek, 1970, p.92).

Some relatively recent, large scale research has reaffirmed the relationship between some teacher characteristics and student achievement. This work finds a close relationship between certain teacher aptitudes, in particular verbal flexibility, verbal fluency, reasoning, and memory, and certain teaching performance variables. These in turn are demonstrably related to student achievement (McDonald, 1977, p.135). Thus it is safe to conclude that a few teacher characteristics are important variables in instruction.

B. PROCESS VARIABLES

As a consequence of the Coleman Report, which maintained that "differences in school facilities and curriculum which are the major variables by which attempts are made to improve schools, are so little related to differences in achievement levels of students that, with few exceptions, their effects fail to appear even in a survey of this magnitude" (1966, p.316) there was little interest in process variables for some time.

However, the tendency to regard input variables as exclusive determiners of outcomes has been substantially reduced in recent years. A wide variety of studies has tended to demonstrate that process variables, and in particular the teacher's role, is in fact more important than allowed for in the Coleman Report. A collection of work edited by Mood (1970), and work by Gage (1972), Rosenshine (see, e.g. 1970), and a collection of research on classroom process by Westbury & Bellack (1971) all indicated a revival of interest in process variables. There is still some doubt about the solid research base. For example, Heath and Neilson (1974) commenting on the Rosenshine & Furst (1971) research summary point out that the studies cited are weak in methodology, and are incompatible. As a basis for the concept of effective teaching, they are not adequate. Heath and Neilson reiterate the results of the Coleman Report, "given the well-documented, strong association between student achievement and variables such as socioeconomic status . . . The effects of techniques of teaching on achievement . . are likely to be inherently trivial" (p.481).

However, this is not confirmed by new data. Bennett (1976) who compared teaching styles of their differential impact on achievement in reading, mathematics, and expression in English, concludes that "in each attainment area the effect of teaching style is highly significant, although the effect of initial level of achievement is most powerful"(p.81). A comparison of various programs in Project Follow-Through, summarizing nine years of research, found sharp differences in achievement associated with a particular program, DISTAR (Becker and Engelmann, 1977). Berliner and Rosenshine (1976) after reviewing such work, conclude that "it is no longer acceptable to take seriously those who minimize the impact of the teacher on the student's acquisition of knowledge"(p.10).

B.1. Institutional Setting

A critical reaction to the Harnischfeger and Wiley (1976) model suggested that one vital area had been overlooked and that this area should perhaps be labelled institutional factors (Erickson, 1976). There is little doubt that classrooms, and teaching, learning, and teacher/student interactions within them, are affected in some ways by those schools and school districts in which they find themselves. There has been considerable research on school climate, and a variety of other institutional variables, and a little on school size.

School climate research has been concerned with both classroom climate and institutional climate. Overwhelmingly, the literature focusses on the development of appropriate instruments, of either observational or self-report types. The best known work is that of Medley and Mitzel on the OSCAR system for observation, and Amidon & Flanders for the interaction analysis system of observation. In the area of self-reports, the best known work is that of Halpin & Croft, the OCDQ. All of this work is reported on in a recent review of research on classroom climates (Nielsen & Kirk, 1974), and their conclusion is that for a variety of reasons no clear relationship between classroom climate and student outcomes is perceptible at present. The validity of the instruments, the lack of agreement on appropriate content of the concept of climate, and the likelihood that climate is not related to student achievement in a linear way all are reasonable explanations for the lack of relationships.

There is one exception to this conclusion described in the literature. The Learning Environment Inventory developed by Walberg does seem to have predictive utility. Summarizing a wide range of different studies utilizing the LEI, Anderson & Walberg conclude that "about half the LEI scales - cohesiveness, environment, friction, queasiness, satisfaction, disorganization, and apathy - account for substantial variance in measure of student learning" (1974, p.94).

At the institutional level, McDill and Rigsby's large-scale study of structure and process in secondary schools found that there were indeed substantial and measurable variations in climate between schools, and that these had some effect on student achievement. The characteristic they

infer from their data and label "academic emulation" is the most important climate variable. A school high on this factor "has a student body and faculty which strongly value academic excellence" (1973, p.184). The effects of this factor are strong: "the more stress placed on achievement, academic competition, and intellectualism by students and faculty, the greater the likelihood of high performance and educational aspirations on the part of individual students" (p.72). This result of a very carefully designed study is extremely important, and justifies Erickson's (1976) concern about the Harnischfeger-Wiley model.

The physical facilities in schools, as they relate to outcomes, have rarely been subject to serious investigation. Immense amounts of time and money are spent in providing different kinds of physical environments, but there is virtually no evidence that even radical changes in environment make much difference to student learning. The research on open area classrooms by and large finds few or no relationships between the kind of classroom and the amount of learning taking place which is not more obviously attributable to other factors, although the most serious study (Traub et al, 1976) did find that "open-space schools tended to have more open programs than did closed-space schools" (p.40).

This study also found that teacher attitudes in open areas were more positive than in other schools, and that teachers interacted more with other teachers and with the principal in such schools. Similarly, the study found that "architecture strongly related to student attitudes towards school, teacher and self . . . and that initiative, autonomy, responsibility to self are related to both program openness and type of architecture" (p.57). However, with respect to cognitive achievement of students there were no relationships for upper SES students between cognitive achievement and type of school. For lower SES students, open area schools were consistently related to lower achievement levels. This is not an unexpected finding: at least one other long term study of the relative effects of open and closed classrooms has found similar results: for some children open classrooms are distinctly disadvantageous (Bell, 1974). In any event these studies agree on finding some interactions between student learning and physical facilities.

The issue of school size, unlike that of class size, has also been relatively ignored in the literature. The only major study of the impact of school size restricted its concern in large measure to the association between school size and extra-curricular activities (Barker & Gump, 1964) finding opportunities greater in small schools. Since recent research suggests that non-academic activities are negatively related to achievement, (Rosenshine, 1976, p.347) one might conclude that large schools with fewer opportunities for extra-curricular activity are more likely to enhance student learning. However, the research really does not allow a generalization of this kind.

B.2. Teacher-Student Interactions

Recent reviews of research have identified a relatively small number of variables in teacher/student interaction as worthy of intensive study. These include classroom management concerns; "clarity", an element which includes planning and organization of work, task orientation, and questioning and explaining skills (Rosenshine & Furst, 1971); variability or variety in classroom activities; and teacher expectations.

Classroom management is an extremely interesting issue for teachers, which in any needs assessment for professional development will rank as a primary concern. In part this is because the issue produces intense anxiety: in part it is because classroom management is enormously time consuming. One careful estimate suggested that teachers in junior high schools spend an average of 22,000 minutes a year in disciplining students (Alschuler, 1973). Additionally, classroom management is very much misunderstood. The work of Kounin (1970) illustrates the nature of the misunderstanding. He sought at first to identify different kinds of disciplinary techniques (labelled "desists") and their effects on students. The results were contradictory and unsatisfactory. Kounin then changed his focus to classroom management techniques, and found that

> there are different dimensions of group management that far outweigh disciplinary techniques in their power to influence the behaviour of children in classrooms. What is more these dimensions of group management relate to producing work involvement as well as to managing misbehaviour... (They) were techniques relating to such issues as progamming learning related variety with intellectual challenge; managing activity movement; demonstrating

> knowledgeability of what was going on regarding children's behaviour; attending to more than one issue simultaneously; maintaining group focus . . . The correlations between teachers' styles of dealing with such issues and children's behaviour are higher than those obtained in previous studies between any attribute of behaviour of teachers and any kind of consequence in children" (p.vii).

Kounin's findings relate rather directly to the findings of other research on effective teaching, and suggest that teacher-student interaction is a very critical area for investigation.

"Clarity" occurs frequently as a variable in research on teacher-student interactions. It is differently defined in various studies, but its importance is often asserted: "a skillful teacher is one who carefully, if not explicitly, plans her school day" (Harnischfeger and Wiley, 1976). Clarity of aims and presentation is associated with effective explaining (Gage and associates, 1971, pp.185-191) and lecturing (McLeish, 1976). Organization of the work of the classroom so as to maximize instructional time and work activity by students is frequently seen as important (McDonald, 1977; Rosenshine, 1977; Bennett, 1976). However, the importance of communicating the objectives of the lesson to the students is by no means established; at best "objectives sometimes help and are almost never harmful" (Duchastel & Merrill, 1973, p.63).

Questioning is not only an extremely important component of the instructional day, (Gall, 1970, p.707) it is also a teachable technical skill, associated with student learning (Borg et al, 1970; Brophy & Evertson, 1977). However, what constitutes effective questioning practice depends a good deal on the kinds of students in the room, and on the type of objectives held for the lesson (McDonald, 1977, p.134).

Task orientation, or the work activity of the child, is given a central role in determining eventual student achievement by a number of different models of instruction, including that of Carroll (1963) and Harnischfeger & Wiley (1976). The relationship between student activity and achievement has been demonstrated by, for example, McKinney and his associates (1975). The use made by students of learning time is perhaps critical in part because there is so little learning time available: Conant (1973) has shown that in a 330 minute school day, an average of only 92 minutes is spent on instruction.

Recent work by Bennett (1976) in Great Britain, in which formal and informal teaching styles and their relationship to pupil progress were analysed, has shown that pupil activity is a critical variable in pupil progress. It provides the link between formal classrooms and pupil progress. "Formal pupils engage in more work activity and progress than informal pupils, and high achieving informal pupils engage in little work-related activity and substantially underachieve" (p.113). In fact, Bennett goes on to conclude that this is the critical variable. His results "suggest that careful and clear structuring of activities together with a curriculum which enhances cognitive content are the keys to enhanced academic progress" (p.160).

Variability or variety is perhaps best seen as a way of alleviating boredom and maintaining task orientation. Kounin suggests that "experienced variety may be relatively more salient for the younger children" (1970, p.138). However, it is often found to be generally important:

> both high-inference and low-inference correlational studies have indicated that student achievement is positively related to classrooms where a variety of instructional procedures and materials is provided, and where the teacher varies the cognitive level of discourse and of student tasks (Rosenshine & Furst, 1971, p.45).

Teacher expectations as a variable affecting student learning was for some time accorded a great deal of attention in the research literature, as a consequence of the Rosenthal and Jacobson study (1968). However, attempted replications of their research failed to confirm the findings, and a recent review of the work resulting from their study by Dusek (1975) concluded that further research was unlikely to be productive. However, once alerted by the original study, observers have reported that students were in fact being affected by teacher expectations. Amongst other interesting accounts is that of Bennett. In a case study, analysing the behaviour of a teacher who elicited high achievement levels from students, it becomes clear that she sets high standards (1976, p.98).

Perhaps the simplest way of summarizing this section is to use classroom arrangement in a broad sense, to include a variety of planned and organized activities which maximize "opportunity to learn" by making good use of time, and focussing instruction on relevant tasks and activities. A teacher excelling in such management who has good questioning and explaining skills and sets high standards, will maximize student achievement.

B.3. Student Learning Styles

Direct research in this area is scanty: one is reduced to using by-products of research studies concerned with other issues. The major exception is with respect to disadvantaged children. Extensive research on the Follow-Through Program is available, and suggests the importance of the "Direct Instruction" model (Becker & Engelmann, 1977), for such children. Rosenshine's (1976) review of this and other research on classroom instruction suggests that the direct instruction model is not necessarily appropriate for other kinds of children.

A variety of different studies has tended to differentiate between high achieving and low achieving children. Extensive research on homogeneous classroom grouping suggests that there is a significant difference in its impact on the two kinds of children (Esposito, 1973, p.171). Thelen's earlier review of research suggested that grouping by ability had no effect on achievement, but some on self-concept (1976, p.29).

Associations between self-concept and school achievement have also been found with some frequency, although the causal relationship is still obscure: it is safest to assume that "there is a continuous interaction between the self and academic achievement, and that each directly influences the other" (Purkey, 1970, p.23). Certainly students with high and low self-concept require different kinds of consideration by teachers.

Self-worth is a concept, similar to self-esteem, which has been used in devleoping the theory of failure-avoidance (Covington & Beery, 1976), which can be (very inadequately) summarized thus: Protection of the sense of self-worth is a basic human motivation. In our society, self-worth is associated with achievement, which is highly valued, particularly when effortless, i.e. based on ability rather than effort (Beery, 1975). Schools offer the first public opportunity to achieve, or fail to do so, and have a major impact on sense of self-worth (Rosenberg, 1965). Early in the school career, students choose between two major patterns of motivation: orientation to success, and avoidance of failure. In the latter, students who have experienced failure do not try hard subsequently, so that they can justify failure by lack of effort, rather than lack of ability. Schools often promote failure-avoidance by emphasis on competitive grading, and on

ability rather than effort (Covington & Beery, 1976). This limits success to the few.

Research in "open education" has been concerned with its impact on different kinds of children. The most extensive and carefully designed study was able to demonstrate an impact of both program openness and architectural openness on various non-cognitive variables, such as initiative, autonomy, and responsibility to self. Further, the study demonstrated that relatively disadvantaged children achieved less well in open programs (Traub et al, 1976, pp.57, 58).

The most recent process-product studies find that high and low SES children are differentially affected, with respect to achievement, by the same teacher behaviour (Brophy & Evertson, 1977; Soar, 1977). This proposition can be put another way: "the kind of teaching associated with the best gains in low SES schools often was quite different from the kind associated with the best gains in high SES schools (Brophy & Evertson, 1977, p.83). One can infer that SES here is measuring some aspect of student learning style. There is some evidence in other sources that SES and self-esteem are closely related, and there is no reason to assume that SES alone determines learning style, whereas we know that self-concept is extremely important in motivation and hence in learning style. Soar hints at this in noting an interaction between SES and motivation in students during the school year: low SES students suffered a decline in motivation and sense of control (1977, p.102). Thus, one could reasonably conclude that these process-product studies are in effect identifying ways of measuring differences in student learning style, and that this is a fundamental variable in the relationship between teaching and learning.

Some research has been done in the area of matching students with teachers, based on student needs. One interesting approach is the work of Thelen and colleagues (1976) in identifying the "teachable group". After describing the weaknesses of traditional grouping practices, Thelen demonstrates that allowing teachers to select their classes demonstrably improves student attitudes. Similarly, elective courses at universities, in which students choose teachers, are associated with positive student attitudes to the teacher (Gage, 1972, p.171). Even more interesting is the work of Hunt and colleagues, based on conceptual development. The approach involves developing a student-environment match which stimulates

growth, by matching student requirements and teacher predilections (Hunt, 1971).

The work of Piaget in describing stages of cognitive development has provided some rather precise differentiations of learning styles associated with age and intellectual development. However, these styles are seen as regularities in a developmental pattern, rather than as a feature of individual differences (Phillips, 1969, p.11).

There seems little doubt that a variety of other characteristics of children have implications for learning, which need analysis. Cronbach (1966) maintains that "the interesting variables may have more to do with personality than with ability" and that "we have to explore a five-fold interaction - subject matter, with type of instruction, with timing of instruction, with type of pupil, with outcome". Bennett provides some support for this: using a variety of personality measures, he concludes that "pupils of the same personality type progress differentially under different teaching styles" (1976, p.140). Presumably, students of different personalities will also progress differentially under the same teaching style.

The research reviewed in this section all supports the contention that the variable labelled "student learning styles" is a critical intervening variable between teaching and learning. McDill and Rigsby, after reviewing the studies demonstrating that attempts to improve student achievement by varying such school factors as gross expenditures, pupil-teacher ratios, and curriculum policies were ineffective, conclude that the crucial element missing is an attempt to match school factors to the needs of students (1973, pp.118, 119). The notion of student learning style is a way of describing the different needs of groups of students. Previous achievement, SES, self-concept and self-worth, and a variety of personality variables are all important measures of learning style, and no attempt to evaluate program effectiveness can afford to ignore this variable.

B.4. Teaching Styles and Methods

In order of importance, the four major elements in teaching styles and methods seem to be use of time, coverage of content, monitoring student work, and methods of presentation. Unlike the components of interaction described previously, these variables are teacher controlled. Bennett developed a typology of teaching styles, based on such elements as teacher role as presenter, pupil role, emphasis on memory, and concern with standards and testing. At one extreme lies "progressive" or "informal" styles; at the other "formal" teaching styles (1977, pp.37-41). The two general styles do affect learning (p.162).

The teacher's use of time in the classroom seems to be an absolutely critical variable. Evaluations of Follow-Through classes have shown that for these relatively low ability students, achievement correlates very strongly with the length of the school day and the length of time spent in the activity, either Mathematics or Reading (Stallings & Kaskowitz, 1974). When these data are linked with results of a major investigation by Conant (1973), in which he found that "relatively little time, an average of 92 minutes, was spent in instruction of any kind" (p.36) in a 330 minute day, during a period in which test scores were falling in the area, a relatively strong association becomes apparent.

As a teacher controlled variable, studies by Armento (1975) and Rosenshine (1968) both found that the relationship between content covered and student achievement was the most important of a variety of variables examined. Similarly MacDonald (1975) found that "teaching procedures which maxaimize the range of content covered are teaching procedures likely to be effective" (p.27). In another context, teacher effectiveness research, this variable has been labelled "task orientation". This is apparently an accurate predictor of student achievement (Rosenshine & Furst, 1971). It has close relationships with the content coverage variable examined under program design.

Monitoring student work is emerging as an important teacher activity variable. Stallings & Kaskowitz (1974) and Soar (1973) both found that supervised work groupings and seatwork were positively associated with achievement, and unsupervised, independent work was negatively associated. Additionally, these studies, and that Brophy & Evertson (1977) found that

student inattention was negatively associated with achievement. Kounin also found that learner accountability "the degree to which the teacher holds the children accountable and responsible for their task performances" (1970, p.119) was positively associated with student work involvement and negatively associated with deviant behaviour.

In contrast to these elements, method of presentation seems rather unimportant as a correlate of student achievement. Various studies, summarized by Berliner & Rosenshine (1976) suggest that for classroom groups at various age levels different teaching methods have approximately the same impact. However, it must be said that the different kinds of methods studied (lecturing, discussion, recitation, computer assisted instruction, textbooks) were relatively limited. Furthermore, rigorous comparisons of effectiveness are difficult to make because of the options open to learners for supplementing the form of instruction provided with other forms of learning. Also, for different kinds of students different instructional methods are likely to be important, and failureto control for student learning styles is likely to obscure relationships between method and achievement.

The most important aspects of methods of presentation seem to be teacher variables labelled "clarity" and "variability", in teacher effectiveness studies (see Rosenshine & Furst, 1971). These have already been discussed under interactions. Gage and Associates found that "clarity of aims" correlated more closely with achievement than a variety of other lesson characteristics (1971, p.170); other studies, e.g. Solomon, Bezdek & Rosenberg (1963) focussed on "organization", which they found to be associated with clarity in their data, and also with achievement. McLeish (1976) in reviewing the lecture as a method, found organization and planning to be important elements (p.299). Additionally, the teacher's ability to explain has been studied intensively: it is a generalized behaviour, which is associated with student achievement (Gage & Associates, 1971).

"Variability" means varying instructional method during a lesson. A review concludes that "student achievement is positively related to classrooms where a variety of instructional procedures and materials is provided, and where the teacher varies the cognitive level of discourse and of student tasks" (Rosenshine & Furst, 1971, p.45). From another perspective, Kounin has demonstrated that the occurrence of discipline problems in classrooms is inversely related to "variety" in learning activities (1970).

C. OUTPUT VARIABLES

This section takes a rather broader view of output variables than is common, and includes discussion of both long and short term goals, costs, and public opinion regarding education. In general, program evaluation has been limited to considerations of student achievement, usually in mathematics and reading, and such a limited consideration of outcomes has been troublesome for a number of reasons: first, it underestimates the impact of schooling on the clients; and second, it allows important interrelationships, proposed in the model here, to be ignored.

What is being proposed here, with reference to outcomes, is that "the designer of evaluation studies should seek to arrange the conditions of the study in such a way that, at its conclusion, cause-effect relationships between the program and its observed outcomes can be made" (Airasian, 1974, p.160). From the point of view of administrators, this criterion of evaluation studies is vitally important: they do not need to know that the program is relatively unsuccessful unless they also know why, with some certainty. That is, "the purpose of evaluation is to help delineate alternatives and to provide information to help decision-makers arrive at more rational choices" (Haller, 1974, p.403).

Unfortunately, most program evaluations have not been useful in this way. They have been purely summative in purpose, intended for assessment rather than development. Formative evaluation, which helps to identify causes rather than simply measuring effects, is still rare (see Bloom et al, 1971, for detailed definitions). Hence evaluation has not encouraged variety and experimentation in teaching approaches, with the result that teaching methods are very similar from classroom to classroom. This uniformity has contributed to the program evaluations which find no significant differences in outcomes with astonishing frequency (Sanders, 1977). More precise identification of productive practices is essential, and a broader view of outcomes will certainly contribute to this.

C.1. Enduring Effects

The long-range outcomes of schooling have been systematically ignored in virtually all analyses, in large measure because of methodological problems. Research by economists, in which years of formal education represent the independent variable some measure of personal economic status, often lifetime earnings, is the dependent variable, is the exception. Most of this research was completed some years ago, and the main findings are well known.

> The results obtained for the U.S. economy offer rather consistent (some might say surprisingly consistent) support for the notion that education, on the average, has paid significant financial as well as non-financial rewards. The evidence is quite strong that individuals with the requisite ability have been well advised to continue their education through university level and there is no reason to think that this pattern will not continue (Bowen, 1968, p.95).

The situation does not seem very different in Canada. With regard to the economic importance of education, an assessment prepared for the Economic Council of Canada suggested that, if eight years of schooling were taken as the base of 100% of income, high school graduation would give an equivalent of 148.1% income (Bertram, 1966). Naturally, there is no reason to assume these figures would hold precisely true for a different period of analysis; nevertheless it seems clear that in general at least, education and income are very closely related, and that this relationship is causal.

It is also common in the literature on the economics of education to find some assessments of additional benefits to individuals, beyond those associated directly with measured income. One of these is the opportunity to obtain still further education, for which high school graduation, for instance, is often a prerequisite. Additionally, education is seen as providing wider employment choices, and to the extent that it is basic or general education, opportunities for withstanding technological unemployment not open to people of lesser education (Bertram, 1966).

In addition to these extrinsic rewards, recent methodological developments have provided overwhelming evidence of intrinsic rewards from education, both personal and social. The work by Hyman, Wright and Reed

(1975) is based on a methodology labelled "secondary analysis". By reanalyzing data contained in fifty-four surveys conducted between 1949 and 1971, they were able to obtain data on the educational attainment of 80,000 adults, and a variety of other data to relate to this attainment (1975, p.4: all references in this section are to the same work).

The major conclusions to be drawn from this research are of several kinds. The first has some bearing on the others: in the earliest cohort, around 65 years of age in 1950, only 8% had attended college; in the latest cohort, around 30 in 1970, about 30% had attended college (p.14). This remarkable extension of opportunity has taken place virtually without any dilution of the effects of education on the individual, since these effects are "uniform and dramatic in magnitude over a period when selective recruitment . . declined radically" (p.14).

> The second conclusion, and the most general and important, is that the better educated do have wider and deeper knowledge, not merely of bookish facts but also of the contemporary world, and that they are more likely to seek out knowledge and be attuned to sources of information. The differences will be found to be substantial in magnitude in national samples of adults who are the products of the universe of schools in several historical periods. These differences are found to have endured despite aging and many years of removal from school or college and to be manifold rather than limited in character (p.21).

This finding remains constant in the study population when the impact of correlates of educational attainment, including sex, race, religion, class, ethnicity, and rural origins, are controlled.

The differences in knowledge are consistent: "There is an increment of every kind of knowledge with each step up the educational ladder that is preserved, no matter how old the individuals and no matter which of the four periods is examined" (p.48). They are also widespread over many different domains of knowledge including vocabulary, career and vocational information, popular culture, sports, and organized labour; "the better educated have wider and deeper knowledge not only of bookish facts but also of many aspects of the contemporary world" (p.59).

It is worth emphasizing that these data describe graduates from many different regions of the U.S., and many different eras in schooling. The consistency of the results suggests an underlying stability in schooling which mocks both the " back to the basics" proponents, and the radical critics and change agents.

The third conclusion concerns the receptivity to knowledge associated with years of formal education. When these include high school and college, the combined effects are substantial.

> Taken as a whole, the data presented in this analysis of a large number of national surveys, covering two decades of recent history and reflecting the impact of education on individuals of varying ages who have been out of school for few to many years, lead us to the conclusion that some of the enduring effects of such schooling are seen in adult communications behaviour and information seeking. Adults who start out with more formal schooling are more likely to exploit the communications opportunities in their society that will keep them informed about significant social, political, personal and academic matters of concern to them (p.92).

This receptivity to knowledge, or propensity to continue learning, is at least as significant an achievement on the part of the schools as the previous two conclusions of this research.

This section can be summarized thus: public school education holds both economic and personal growth benefits for individuals of all kinds. It has achieved its major goals, the development of basic skills for learning and the development of positive attitudes to learning, consistently for most clients. Hyman and his colleagues conclude "if . . one of the long-range goals of formal education is preparation for a lifetime of learning, then our data present strong evidence for the conclusion that schools are achieving this goal to an observable degree" (p.92). This success is currently being carried to a larger and larger proportion of the age group, apparently without dilution of effectiveness.

C.2. Program Costs

The notion that costs should be considered an outcome variable, rather than an input variable, is justified on two bases. First, as a matter of practicality: program costs are notoriously difficult to predict especially in the case of new programs, or modifications of programs. In such cases, one can legitimately ask whether or not it is vital to predict costs, as opposed to computing them after the fact. Second, the most important use of costs in program evaluation is in the context of cost effectiveness comparison. In such decision-making, either the comparative value of two or more programs is at issue, or the general level of effectiveness by comparison with costs. For these considerations, decision makers must have data on program outcomes after the fact. Thus, cost data similarly computed after the fact by standard cost accounting techniques is perfectly appropriate.

Stating the costs of a program in terms of alternatives is most important and frequently overlooked. As Haller puts it, "every decision has alternatives: the value of alternatives not chosen is the cost of the decision, and the meaning of cost in any evaluation depends upon the alternatives involved" (1974, p.408). For example, in calculating cost/benefit balances of years of higher education, economists normally include "opportunity costs", which include the value of foregone earnings in the years the student attended post-secondary education (see, for example, Blaug, 1968, pp.234-236).

For public school education, cost alternatives are often other programs, with similar objectives and similar outcomes. If our alternatives are other programs, in most cost considerations in public school education we need not predict costs. Haller's conception of the work of the evaluator, "the evaluator's cost analysis task is to accurately portray two or more alternative futures so that the decision maker can choose among them" (p.408) is not often an appropriate consideration for educational administrators. We need to be able to measure cost effectiveness after the fact, to decide on alternatives.

The most important cost in any program is student time. The importance of time as a variable in determining achievement has already been stressed, but it has a special importance as a program cost element. Program costs consist generally of teaching, administrative and support staff, building

space and special facilities such as language lab, textbooks and other print and non-print materials, and possible consultant assistants for training staff, developing program specifications and providing evaluations. All these factors are translatable into dollar costs and generally if dollars are available, all these elements can be found. However, student time is not elastic, unlike the school district's budget, and must be withheld from other activities or programs. Hence the effectiveness of a new educational program at least in principle can always be considered in terms of the effectiveness of the program from which the student time was taken. Bowman has coined a term, "foregone learning", paralleling foregone earnings, to describe this feature of program costs (Haller, 1974, p.431).

Accountability, under a variety of labels, is a continuing theme in education (Callahan, 1962). In recent years it has become salient because of escalating educational costs, and doubts about outcomes fueled by the Coleman Report (1966). A simple definition is that accountability involves holding people "responsible for what they do in terms of relationship between objectives promised, resources applied and outcomes realized" (Wescott, 1972, p.87).

The most common approach to accountability has been through Planning Programming, Budgeting, Evaluation Systems which were introduced widely in the United States a few years ago. PPBES "is the detailed expression of the methodology of systems analysis" (Hartley, 1968, p.69), and also of cost-effectiveness considerations: "the costs of a particular course of action should be compared with anticipated benefits and then weighed against alternative courses of action" (p.97). In Canada, program budgeting was particularly popular in Alberta (see, e.g., Riffel, Watts and Hudson, 1972).

In general most such projects found the program budgeting aspect easy, and the program evaluation, with respect to cost effectiveness, extremely difficult (see, e.g. Conant, 1973, pp.19,20). In part this was because the evaluation of educational programs, with regard to cost effectiveness, essentially provides a very pointed value question: If a program like compensatory education is expensive and relatively ineffective, in terms of gains on tests of basic skills, do you abandon it, or do you spend more money on it?

There are of course other issues raised by PPBES, not the least of which concerns the non-measurable aspects of programs. However, the specifications of goals and of objectives of educational programs, and measurement of outcomes via some form of attitude or skills measurement is essential in any program evaluation. Yet this is by no means a satisfactory form of evaluation in isolation. This is largely because such evaluations are purely summative, and consequently do not provide any guidance for administrators. It is not very helpful to school people to tell them that the programs are not working effectively if you cannot also provide some information which helps them to plan their remedial action with some hope of success.

In view of the fact that the costs of education have risen alarmingly in the last few years (see Coleman, 1978) and the concern for accountability, it is surprising that more attention has not been paid to the merits of differentiated staffing. In the late 1960's and early 1970's, this innovation was considered very attractive in part because of cost considerations (Coleman & Wallin, 1972). There was no evidence that it was detrimental to student achievement, and a good deal of evidence that it was a cost-effective way of providing educational programs. Conant's (1973) very careful assessment of this model in the context of providing for disadvantaged students found virtually no difference in effectiveness, and surprisingly little change in teacher activities, as a consequence of the new staffing model. However, there is a substantial difference in costs. In general, it seems reasonable to conclude that program elements, including achievement, can be held constant while other elements substantially affecting costs can be varied with rather useful results, at least from the point of view of taxpayers.

In general, there is probably a clear relationship between teacher employment patterns and the absence of interest in differentiated staffing. At a time when declining enrolments threaten teacher employment, and staff redundancy and surpluses are critical political issues, it is unlikely that administrators will be very much concerned with cost effectiveness. But restraint in public spending is also a feature of the current educational scene, and it will be interesting to see which value, restraint or continued teacher employment, is dominant in educational decision-making. At present there is little evidence that restraint is winning (Coleman, 1978).

C.3. Student Achievement

Virtually all program evaluations are based on a relatively narrow set of outcomes, usually test scores in mathematics and reading. This is true of those studies finding school variables unimportant, such as the Coleman Report, and those process-product studies which find that school variables are important, such as the work collected in Borich (1977). Evaluative studies utilizing higher cognitive outcomes, or affective measures, as well as adequate designs, are rare (but see Traub et al, 1976, for a good illustration of thorough evaluation). In part this is because the instruments available in the affective domain are relatively weak in validity and reliability (see C.S.E., 1972). Yet increasingly, educational programs, policies and practices have a broad range of objectives, and educational goals have always included goals in the affective domain. A few good studies have shown that important affective outcomes do result, in some cases without comcomitant cognitive gains (although it also now seems to be the case that affective outcomes, for disadvantaged children, are consequent upon cognitive outcomes (Bloom, 1976, p.140).

Standardized tests have been subject to a great deal of criticism in recent years (see, e.g., Skager, 1971). In part this is because test scores are falling, the reasons are obscure, and educators are angry and frustrated. The tests themselves are a tempting target. However, most of the attacks are self-serving and unconvincing, frequently taking the form of criticising the tests for not doing things they were never designed to do (see, e.g., the rebuttals by Sax, 1974, and Rudman, 1977).

The most important issue raised by these critics is the extent to which standardized tests match the curriculum objectives of the programs they are used to assess. The test-makers design these tests to match available instructional materials: "there is a relatively uniform educational program among U.S. school districts. If one accepts the assumption that education programs consist mainly of the instructional materials available to pupils and teachers, we do have a national education program" (Rudman, 1977, p.182). Standardized tests are useful in assessing programs if the test objectives correspond closely with the program objectives (Sax, 1974, p.258). But in many cases there is not a good match, and this is likely to be particularly true of innovative and locally-designed programs, which might be eclectic in

objectives and content.

There are other difficulties: it is unlikely that the items and norms for standardized tests in isolation can provide reasonable measures of program effectiveness. Airasian concludes a technical discussion of standardized tests thus: "the use of standardized tests as dependent variables in comparative evaluation studies can be summarized as the process of using insensitive, individually discriminating measures to identify differences between groups" (1974, p.177). In general, standardized tests have their main utility in providing an overview of the extent to which local school district programs are comparable in content to national programs (p.176). Airasian recommends, for local evaluation studies, "measures which do not singly tap all effects but which, when taken in combination, tap numerous, widespread outcomes" (p.177).

Formative evaluation was initially used by Scriven (1967) to describe evaluations conducted during the development of a curriculum. It is still used in this way (Gage & Berliner, 1975, p.763). But Bloom et al use the term differently: formative evaluation is "the use of systematic evaluation in the process of curriculum construction, teaching, and learning for the purpose of improving any of these three processes" (1971, p.117). Thus it has been used with reference to diagnosis of teacher difficulties (Coleman, 1973); similarly, in mastery learning approaches, formative tests are used to identify appropriate corrective techniques for students having difficulties (Bloom, 1976, pp.125-129). Thus formative evaluation, properly utilized as described in Bloom et al (1971), has great utility in improving learning while it is taking place, and can provide vitally important data for decision-makers regarding the interaction of relevant variables in the educational process.

The general affective outcomes of schooling are apparently cumulative and strong. In reviewing the research, Bloom summarizes the findings thus: "relatively strong affect has been developed in many students by the end of the elementary period of schooling" (1976, p.150). The negative affect seems to be more certain, more readily generalized to the whole institution, and to learning of any kind (p.152). This is of course extremely dysfunctional for the individual and for society in a period when the pace of social change places such a premium on adaptive behaviour (see Hunt, 1971 for discussion of this). In addition, there are clear relationships between specific practices

and programs and affective outcomes on occasion (see, e.g. Esposito, 1973, on grouping practices, McDill and Rigsby, 1973, on climate, and Purkey, 1971, on self-esteem consequences).

Affective outcomes are widely recommended (see, e.g. Gage and Berliner, 1975), and a variety of useful studies exist which can be used to provide guidance to teachers in developing affective objectives and measures of effectiveness (see, e.g. Bloom et al, 1971). However, considerable concern about such objectives remains, based on value considerations, labelled "fear of indoctrination" by Bloom et al (1971, p.226), and concerns about the effectiveness of such attempts. Both are justified: self-esteem testing has been objected to as an invasion of privacy by groups concerned about values teaching of any kind in schools. Further, reviews of research of socialization attempts in schools are not encouraging (see, e.g. Coleman, 1973a, on political socialization, and Gage & Berliner, 1975, p.482, on humanistic education).

C.4. Perceptions of Schooling

Treating the "image" of education as an output variable separate from the enduring effects of education (i.e. long term goals) and student achievement (i.e. short term goals) may seem whimsical, but any experienced administrator will recognize that the perception of her school system in the minds of the general public is formed largely by factors having little or nothing to do with the educational outcomes of the schools; for example, recent criticisms of the public school system have completely ignored data on student achievement. Thus, the image of the school system is a matter of independent importance to administrators.

Parent opinions have been extensively surveyed, both in the U.S. and other countries. Acland (1975) reviews fifteen major surveys, of which seven dealt separately with parents. The results are overwhelmingly supportive: "samplings of public opinion showed that parents, and everyone else for that matter, had a very good opinion of public schools" (p.1). The surveys indicate that generally about 80% of the respondents have positive reactions to the public schools. Sometimes the level is higher: with respect to "the quality of instruction in the local public schools" Carter and Chaffee (1966) report that 93% of parents rated it good or very good. This opinion does not vary

with social group, with region, or with English-speaking country. Furthermore, these attitudes are stable over time. There is every indication that Canadian parents share the same attitudes (for Manitoba, see Department of Education, 1975; for Ontario, see Adams et al, 1972).

However, Acland (1975) after reviewing this evidence, proceeds to argue that this parental satisfaction is based on relatively little information about what happens in schools, and little agreement about what schools should be doing. Furthermore, parents are unable to make effective choices between alternative forms of education. Acland argues that if parents were able to made choices they would be more critical of the public school system, and this would account for choices they made. However, this turns out not to be true either: "when parents can make effective choices they still strongly approve of the public schools" (p.9). It hardly seems possible to deny that, whatever the state of their knowledge, parents do overwhelmingly approve of the public schools. It is hardly conceivable that any other consumer judgements of any institution, product, or service in our society would be as positive.

The feelings which students have about school have been the subject of relatively little research until recently. Early research was summarized by Jackson (1968) and suggested that in general 80% of all students are positive in their feelings about school, that this general positive feeling is more common amongst girls than boys, that there are aspects of school which are more positively perceived than others, in particular teachers, and that these are balanced by unpleasant aspects, in particular the fear of failure. Amongst other unpleasant aspects, boredom is probably the most common. There is a great deal of stability in these expressions of opinion, which are generally unchanged in different places, at different times for the last thirty years, and in different grade levels.

The opinions of the general public, although in general similar to those of parents, have notably declined in supportiveness in recent years, as reported in the continuing Gallup polls. This may be associated with reported declines in achievement scores; the link is supported by the relative popularity of the notion that the quality of the public schools could be improved by devoting more attention to teaching basic skills (Gallup, 1976). Such concerns may well reflect mass media criticism, especially the widely reported test score declines.

The opinions of teachers are relatively more difficult to summarize. In general, teachers are deeply uneasy about the outcomes of schooling and their own effectiveness. In a discussion of diffuse anxiety in the profession, Lortie reports "no aspects of the teacher's work evoked as much emotion as this issue of assessing outcomes" (1975, p.142). Most of this feeling was negative: "one finds self-blame, a sense of inadequacy, the bitter taste of failure, anger at the students, despair, and other dark emotions" (p.144). Such feelings are exacerbated by isolation and a lack of consensus on the issue of teacher effectiveness (p.150), and by the rising tide of criticism, apparently representing public opinion (p.222).

Although the careful opinion surveys already referred to do not entirely sustain the image of public criticism and lack of confidence carried in the mass media, teachers read newspapers and watch television rather than scholarly reports. Since uncertainty is characteristic of their work, and anxiety is endemic, they tend to believe that they are not supported by the community at large. Teacher attitudes are vitally important data in considering program outcomes, and in determining effectiveness, yet they are virtually neglected in prorgram assessments.

D. USING THE MODEL

This review of twelve variables in a systems model of factors affecting educational programs suggests some conclusions which can be useful to administrators with responsibility for program development.

1. Input variables do tend to determine educational outcomes. Goals are relatively stable, and should be, because the educational system itself does not change much in its impact in clients.

2. Program design is largely important in terms of the "opportunity to learn" criterion, of which time is a vital element.

3. Student characteristics are the most important input variables, in total determining at least 50% of variance in achievement, even at the elementary level.

4. Some teacher characteristics affect learning. Cognitive development, and particularly verbal facility, is the major variable.

5. Process variables of various kinds are important. The institutional setting, and particularly its emphasis on particular educational values such as academic excellence, does affect student achievement at all grade levels.

6. Teacher/student interactions, particularly good classroom management, in which "opportunity to learn" is maximized by making good use of time and focussing on relevant student tasks, maximizes student achievement.

7. Student learning styles are related to the input variables labelled student characteristics. It is clear that students learn in different ways, and effective educational programs take this into account. For example, open education seems to be useful for high SES children, and dysfunctional for others.

8. Teaching style variables are less important, but have some impact on achievement. Teacher-dominated classrooms, with minimal management

problems, close monitoring of student activities, learner accountability, and high task orientation, are associated with good achievement levels. Teachers require management skills, clarity in organizing and explaining work, and effective questioning techniques.

9. Output variables of several kinds are important in program development. Education has stable long-term benefits for individuals, both economic and intrinsic. These are associated with adaptive capacity, and the propensity to continue learning throughout life. Schooling has been extremely beneficial for most of its clients in the last half-century.

10. Program costs have risen sharply in recent years, despite new management techniques, and concerns regarding cost-effectiveness. Other social policy issues have taken precedence, and the cost-effectiveness of education has undoubtedly declined. Student time, the constant, has perhaps been misused.

11. Short-term outcomes, and particularly standardized test scores in reading and mathematics, have been widely used in program assessment, to the detriment of our programs. However, declining achievement levels, informal or open education, and the ineffective use of student time, are perhaps related. This is particularly true for lower SES children.

12. The opinions which various groups hold about education are generally quite stable, although there have been recent declines in public confidence in the U.S. Teacher anxiety about effectiveness is high and stable, and constitutes an important element for consideration in program development.

Given the complexity of the situation, administrators responsible for program development might be tempted to simply maintain traditional programs and practices because these are more acceptable to public opinion. However, many of these are demonstrably ineffective, by any standards. Our new knowledge makes such an approach clearly an abdication of professional responsibility. At least one notion of leadership suggests that it consists of an activist orientation, the view that in organizations everything gets worse without

constant effort to improve (see Coleman, 1976, for further discussion). The appropriate response for the accountable administrator, is to plan a sustained multi-year effort to accumulate relevant information, and to use the data in controlled small-scale experiments attempting to find ways to maximize learning. The balance of this paper describes efforts to do this in one school district. Unavoidably this description will seem to be an advertisement for the merits of a particular school district; however, it is intended to suggest only that such activities and efforts to undertake small-scale experimental program changes are not impractical.

D.1. Input Variables

In St. Boniface, a general set of educational goals was derived some years ago, in consultation with parents, staff, and students. The goals were confirmed and priorized by the Board of Trustees. They form the basis of program development activities, and of administrator activity and assessment (see Coleman, 1972, 1975).

Program design, in five main instructional areas, Language Arts, Social Studies, Mathematics, Science and Francais, is the subject of a major activity in the district, in which over 200 teachers (of a total professional staff of about 450) have had some degree of involvement. Some programs draw heavily on provincial guidelines, and others are elaborated far beyond the level of provincial course outlines. The Teacher Centre is responsible for this activity, which provides useful inservice training for teachers as an additional benefit. In essense, this activity will in due course yield clearly defined objectives, activities and formative evaluations. This will assist teachers in maximizing "opportunity to learn".

Student characteristics are assessed in a variety of ways. The careful screening of children entering Kindergarten provides initial information on readiness and identifies "at risk" children. A "school preparation" program for some pre-Kindergarten children, and a full-day Kindergarten program are alternatives currently being tried for such children.

Tests of intelligence and self-concept provide useful diagnostic information. A minor experiment has demonstrated that some underachieving

children are helped more by self-concept development programs (see, e.g. Canfield and Wells, 1976) than more traditional remedial programs. Attitudes to various aspects of the school programs, including libraries, outdoor education and music are assessed from time to time.

Teacher characteristics are assessed as part of the selection process (Coleman, 1973). Verbal ability and attitudes to students are measured, and a comparison of these scores elicited prior to employment with subsequent ratings by administrators demonstrate that high scores predict administrator ratings quite accurately. Thus they are useful selection procedures.

D.2. Process Variables

Institutional variables such as school climate are important. In St. Boniface, annual student and teacher attitude surveys help to assess school climates. This data has shown that the school principal has a very significant impact on staff attitudes, and that positive staff and student attitudes are often associated. No work has been done on issues concerning school size and physical facilities.

In the area of teacher/student interactions, the dimensions of clarity, questioning, variability, explaining, and student task orientation comprise important portions of teacher evaluation procedures (Coleman, 1978a). Further, training in questioning is provided through the Teacher Centre, utilizing microteaching and minicourses developed by the Far West Educational Laboratory (Coleman, 1976a). An evaluation project has demonstrated that teacher behaviour does change in the desired directions as a consequence of this training (Asper, 1978; see also Borg et al, 1970). The other process dimensions have not been the subject of specific activity.

D.3. Output Variables

Outcomes of schooling are generally closely examined. However, it is difficult for school districts to accumulate data on the enduring effects of education. In St. Boniface we know that the freshman year grade point averages of St. Boniface graduates at the University of Manitoba is exactly at the

mean for the freshman class. This is unsatisfactory, and will result in re-examination of course options available in secondary schools. No other information is available.

With regard to costs, comparative costs are available annually through a survey of school district budgets conducted by the Manitoba Association of School Trustees. In 1977, costs of instruction in St. Boniface were $1,119.07 per student; the median for urban districts was $1,139.85, and for the province $1,084.92 (MAST, 1978). This is satisfactory, because a rather wider range of programs than normal is provided, with at least average effectiveness. Differentiated staffing is used in a few schools to control costs.

Annual reports on achievement, school by school, are provided to the Board of Trustees, to meet accountability requirements. These will include, in 1978, test scores on the Canadian Test of Basic Skills, the Stanford Tests of Academic Skills, Music Skills and Attitudes, Physical Fitness, and self-concept. Additionally, the results of surveys of parents, students, and teachers will be provided, school by school.

With regard to student achievement, a wide variety of standardized and criterion-referenced tests is used annually to provide information. A major weakness is the absence of data on Social Studies and Science. Until program design work is complete, it will not be possible to develop formative tests in these areas. Generally, achievement levels are at or above national and/or provincial norms.

However, with respect to core French in the elementary schools, test results indicate that the program, conducted according to provincial requirements, i.e.30-40 minutes of instruction at least four times in a six-day cycle, is completely ineffective. Test scores of the comprehension of students in Grade 6 with from one to six years of exposure to French were similar, and virtually at chance levels of accuracy. That is, one year of the program makes no measurable difference to students' knowledge of French; nor does six years. This suggests that the program is a waste of student time, a very scarce resource in elementary schools. In cost-effectiveness terms, a program becomes indefensible when the outcomes approach zero, even when costs are low.

The perceptions of schooling in St. Boniface are assessed via annual surveys of students (Grade 11), parents (10% sample) and teachers (all). These were all designed or at least modified to meet local needs. The student survey reports on three scales, school in general, programs, and teachers, and reveals sharp differences between schools, annual shifts of opinion, frequently negative attitudes towards programs and classes (50% of the students report that they are often bored), and positive attitudes towards teachers and teaching methods. The parent survey is still being developed: parents were asked to submit relevant items, and did so. The result of a compilation of these items is a survey focussing on school climate, particularly discipline and communications with students and parents; teachers, particularly general attitudes and expectations, such as commitment and standards for students; and programs, particularly basic skills emphasis and motivational aspects.

The teacher survey yields data on goals; attitudes to school, including students, peers, and administrators; and professionalism. Longitudinal and inter-school comparisons reveal that the survey is sensitive to staff and administrative changes, community criticism of individual schools, and district-wide issues such as teacher redundancy. Far the most important influence on teacher attitudes is that of the school principal; this can be negative or positive.

* * * * *

This brief description of activities in one school district is intended to exemplify ways in which the model of variables affecting educational programs can be used in program development. Major gaps in knowledge and its utilization exist in the sample district, in particular with reference to careful formative evaluations at the secondary school level. However, the state of the art in program evaluation is now beginning to provide useful guidance for accountable administrators, who can,for the first time, hope to disentangle the complex cause-effect relationships and write a local "recette d'apprentissage".

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